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DO COOPERATIVE INITIATIVES IMPROVE TRANSIT PERFORMANCE?
THE IMPACT OF COOPERATION BETWEEN AGENCIES ON TRANSIT
PERFORMANCE

A Thesis

Submitted to the Graduate Faculty of the
University of New Orleans
in partial fulfillment of the
requirements for the degree of

Master of Science
in
Urban Studies

by

Anne-Marie Rooskens

M.P.A., University of Enschede, The Netherlands 1995

August 2005

Table of Contents

List of Figures and Tables	iii
Abstract.....	iv
1. Ridership Decline in the New Orleans Region.....	5
1.1. Cooperation between Transit Agencies to Improve Performance	7
1.2. Research Question	8
2. Regional Reform as a Way to Improve Transit Performance	9
2.1. Regional Reform Discussion	9
2.2. The Definition of Transit Performance	12
2.3. Factors that Could Impact Transit Performance	14
3. Data Collection and Methods	17
3.1. National Transit Data Base for Performance Data.....	17
3.2. Questionnaire and Transit Web-site Analysis for Regional Initiatives Data	17
4. Analysis: Performance and Regional Initiatives.....	19
5. Findings & Implications	28
References	30
Appendices	32
Vita	35

List of Figures and Tables

Figures

Figure 1. Transit production process.....	13
Figure 2a. Arrow model transit efficiency	16
Figure 2b. Arrow model for transit effectiveness	16
Figure 3. Service efficiency: operating expense per vehicle revenue mile.....	22
Figure 4. Service efficiency: operating expense per vehicle revenue hour	24
Figure 5. Service effectiveness: unlinked passenger trips per vehicle revenue mile	25
Figure 6. Service effectiveness: unlinked passenger trips per vehicle revenue hour	26
Figure 7. Factors attributing to performance change: agencies with cooperative initiatives	27
Figure 8. Factors attributing to performance change: agencies with and without cooperative initiatives	28

Tables

Table 1. Expected benefits from cooperation between transit systems in the region.....	8
Table 2. Different metropolitan reform approaches	11
Table 3. Transit agencies with and without cooperative initiatives.....	20
Table 4: Performance date of transit agencies with and without cooperative initiatives	21
Table 5: Test assumptions and statistics	23

Abstract

Ridership in the New Orleans region is down, and transit agencies are challenged to increase transit performance. Transit professionals expect many benefits from cooperation between transit systems in the region including an increase in efficiency and effectiveness. The question is “do these cooperative initiatives between transit agencies improve transit performance?”

To answer this question a survey has been held to collect data regarding regional initiatives implemented by transit agencies. In addition data were collected from the transit agencies websites. The analysis focused on the comparison between agencies that implemented regional initiatives versus agencies that did not implement any regional initiative.

From the analysis it appears that although agencies have implemented cooperative initiatives they are not very convinced that it had a significant impact on transit performance. Further, results show that cooperation might have some positive impact on transit performance, but are not as convincing as literature and transit professionals expect.

1. Ridership Decline in the New Orleans Region

Transit is an important element in today's society. In the year 2000 Americans took 9.4 billion trips using public transportation, the highest ridership level in forty years (American Public Transportation Agency 2004). The New Orleans Regional Transit Authority provided roughly fifty-one million bus trips in Fiscal Year two thousand, and five million trips by streetcar (US Department of Transportation 2000).¹ Public transit allows people, who have no alternative transportation, to carry out the many activities that make up daily life (Hanson 1995: 3). The poor, elderly, handicapped and minorities; the so-called transportation disadvantaged, are most likely to be dependent for their mobility on public transit. Almost 38 percent of all transit users have an income under twenty thousand dollars. As income goes up, the percentage of transit riders decreases (Pucher and Renne 2003: 63).

Besides the provision of mobility, transit proponents claim many other factors which make transit important; transit helps the environment and conserves energy, it helps to relieve congestion, and reduces hours of delay in major travel corridors. Some proponents claim that traffic congestion causes an annual loss of \$40 billion to U.S. business. If all public transportation commuters drove instead, the loss would increase by over 37 percent (American Public Transit Agency 2004). Thus people who do not use transit benefit from it as well.

Another indication of the importance of transit is the amount of public money involved. In most industrial countries approximately two-thirds of the costs is funded by the government (Hanson 1995: 298). In the U.S. the federal government alone spends approximately six billion dollars each year on surface passenger transportation.

¹ Unlinked passenger trips; the number of patrons boarding public transportation vehicles. Thus, if a rider travels from A to B and has to change vehicles, this trip will be counted as two unlinked passenger trips.

The public transit industry is big; in the year 2000, 350,000 workers operated, maintained and managed all modes of transit in the U.S.. In addition, 10,000-20,000 professionals work under contract to public transportation systems or are employed by companies and government offices that support these systems. The public transportation fleet is comprised of 129,000 vehicles. (www.publictransportation.org cited 11-2004).

The term 'public transit' can be used to refer to many different transportation services including light rail, bus, and demand responsive services. Bus is the most widely used form of transit (Hanson 1995:291, Fielding 1987:5). Therefore, the focus will be on fixed route bus transit.

The most likely users of public transit systems are the poor, elderly, handicapped and minorities; the so-called transportation disadvantaged. One of the goals of public transit is providing cheap mobility for these groups. The New Orleans area is a poor region with a large percentage of minorities. In Orleans Parish 27,9 percent of the people live in poverty (Census 2000), whereas in the US 12,5 percent of people were living below the poverty line in 2000. In the year 2000 the number of Blacks or African Americans was 67,3 percent in Orleans Parish, whereas in the US 12,3 percent of the population belonged to this group (Census 2000 website).

Thus one can expect that for many public transit is important. However, during the last six years, ridership figures have shown a decline of 22 percent. There are different causes for this decline including demographics and the quality of transit service (Times-Picayune, 2002, Interview S. Leader, 2002). Orleans Parish lost 2.5 percent of its population according to 2000 Census. In addition, four public housing complexes which generated large ridership numbers were demolished, and there has been a decline of public school enrollment. One transit service quality aspect causing ridership decline is the increasing unreliability of service, i.e. buses are not on time or exclude stops on their routes. Another quality factor often blamed for at least

being partial responsible for the downtrend in ridership figures is the lack of regional cooperation between transit agencies in the New Orleans region.

1.1. Cooperation between Transit Agencies to Improve Performance

The decline of ridership provides a challenge for the transit agencies, in that they have to develop and adopt new approaches towards transit. Transit professionals in the region agree that cooperation between transit agencies would benefit the transit system and could therefore be an approach to improve transit performance. Examples of cooperative efforts include: one fare system, shared transfer points, express busses from suburban to central city, and a regional trip planner (Rooskens 2002, Rusk report 1999).

Currently, transit in the New Orleans region is organized on the local (parish/county) level. The largest transit agencies are the Regional Transit Authority in Orleans Parish, and Jefferson Transit in Jefferson Parish. Besides these transit agencies, there are a few other small agencies in adjacent parishes. Many transit agencies in the US are organized on the county/parish level. Cooperation will therefore many times be between counties. Table 1 shows the benefits that transit officials in Louisiana expect of cooperation between transit agencies in the New Orleans region.

Table 1: Expected Benefits from Transit Cooperation in the Region

Expected Benefits from Cooperation between Transit Systems in the Region	
MANAGEMENT	<ul style="list-style-type: none">▪ Minimize administrative costs▪ Improve financial efficiency▪ Increase transit use
QUALITIES OF PUBLIC TRANSIT EQUIPMENT	<ul style="list-style-type: none">▪ Better utilization of equipment
ROUTES / SERVICES	<ul style="list-style-type: none">▪ More realistic routes▪ Easy transportation between parishes▪ Transit becomes alternative to automobile▪ More service efficient routing▪ Improve reliability of the overall system from the riders perspective▪ Improve efficiency of the system (i.e., travel time savings) from the riders perspective▪ More complete coverage of the region (i.e., service area)▪ Decrease travel time

Source: Rooskens 2002: 9.

1.2. Research Question

Ridership decline in the New Orleans region and high expectations about cooperation from local transit professionals, are the triggers for this study. This article will address the following research question:

Does cooperation between transit agencies improve transit performance?

In other words, do cooperative initiatives between transit agencies in the same region improve transit performance in terms of cost efficiency and service effectiveness as defined by the FTA? As a follow-up more specific topics regarding New Orleans can be addressed.

2. Regional Reform as a Way to Improve Transit Performance

Ridership decline provides a challenge for transit agencies to develop and adopt new approaches towards transit. Transit professionals in the region agree that regional transit reform would benefit the transit system, and could therefore be an approach to improve transit performance (Rooskens 2002, Rusk report 1999). Note that there are many other ways to deal with the ridership decline; however this research focuses only on regional transit reform as a way to improve transit.

Regional transit reform refers to a variety of approaches; from mergers to cooperation between transit agencies. There exists lots of literature about regional reform as a way to improve transit, and many regional initiatives are being planned or implemented. Unfortunately, impact studies of regional initiatives have been lacking (Rafter and Alter 1991:233). This research will contribute to fill this gap, by addressing whether regional transit reform could improve transit performance.

2.1. Regional Reform Discussion

The most often used argument in favor of regional reform is that fragmentation of the government structure results in a lack of a metropolitan-wide political perspective, conflicts between local governments, and severe service delivery problems (Stephens and Wikstrom 2000: 48). More specifically, the general problems supposedly caused by the fragmented structure of a metropolitan area, as summarized by regional reform advocates, include (Stephens and Wikstrom 2000, and Ostrom, Bish and Ostrom, 1988: 65): (1) inefficiency and ineffectiveness, (2) fiscal disparity due to disparity of wealth among communities, (3) local public services which are marked by inequality and lack of equity, (4) services delivered by a multitude of local governments, which could be provided on a metropolitan wide basis, (5) unplanned, not coordinated development, (6) confusion of responsibility; citizens are unclear which jurisdictions

should perform what functions, (7) lack of metropolitan-wide political leadership sensitive to the interest of the entire region. Fiscal disparity of wealth and inequality and lack of equity are considered problems in the light of major goals of government: (1) efficiency, equity, financial balance and macroeconomic stabilization (De Borger, Kerstens, Costa 2002: 3).

Many (Stephens and Wikstrom, 2000: 48) argue that to resolve the problems caused by fragmentation metropolitan reform is necessary.

There are various ideas about metropolitan reform, and they are categorized in different reform approaches: (1) the consolidationist approach, (2) the multitiered approach, (3) the linked functions approach, (4) the complex networks approach, (5) and the public choice approach (Savitch and Vogel 2000: 163). The consolidationist and the public choice approaches are opposite; consolidationists favor a single government in a metropolitan area, whereas public choice analysts advocate the existence of many municipalities in a metropolitan area who can compete with each other. These approaches are listed in the following table.

Table 2: Different Metropolitan Reform Approaches

Metropolitan Reform	Explanation
Consolidationist Approach	Elimination of independent municipalities and replace with single government
Multitiered Approach	Small jurisdictions deal with 'narrow issues' and metropolitan tiers deal with wide issues
Linked Functions Approach	Link between a number of services of different localities
Complex Networks Approach	Cooperation of independent governments through multiple overlapping web of interlocal agreements
Public Choice Approach	No functional optimal size for municipal governments

Source: Based on Savitch and Vogel 2000: 163.

When applying these different approaches to transit organizations, the implementation of the consolidationist, multitiered and linked functions approach will probably result in the same thing: one transit agency for the region. With the consolidationist approach this regional transit authority would be embedded in an overall regional government. In the multitiered approach transit would be a wide-issue assigned to the metropolitan tier, and therefore it would be very possible that a regional transit authority would be created. In the linked functions approach, the transit function will be linked between different localities, which could also result in a regional transit agency. The complex network approach would be metropolitan reform in the sense of cooperation between different transit agencies through local agreements, without the creation of a regional authority. The public choice approach prefers the fragmented status quo so that many transit agencies will compete with each other which will increase the service.

This research focuses on one reform approach only, as the various reform approaches include different dimensions, structural consolidation and regional relationships and therefore, their impact on transit performance might be of a different proportion (Hamilton, 2000:67). Transit professionals in the New Orleans region consider the complex network approach, cooperation between the different transit agencies through interlocal agreements, as the most feasible in the New Orleans area. They expect that the creation of one transit agency for the New Orleans region is politically not feasible for a variety of reasons: the lack of political will, a what's-in-it-for-me attitude, racial issues, and bad relationships between the leaders of different parishes in the region (Rooskens 2002). Some professionals believe that interagency cooperation would be the first step towards a single regional transit agency. Another reason to study the complex network approach is that the regional reform approach is a pragmatic one. I would like to compare cooperation or mergers with fragmentation, and expect that there only will be a few, if any, merger initiatives in the data collection period (1996-2000).

When regional reform according to the complex network approach is translated to transit, it refers to initiatives of more than one transit agency; a cooperative effort between different

transit agencies to improve overall transit. Examples of such initiatives include: one fare system, shared transfer points, express busses from the suburbs to central city and a regional trip planner.

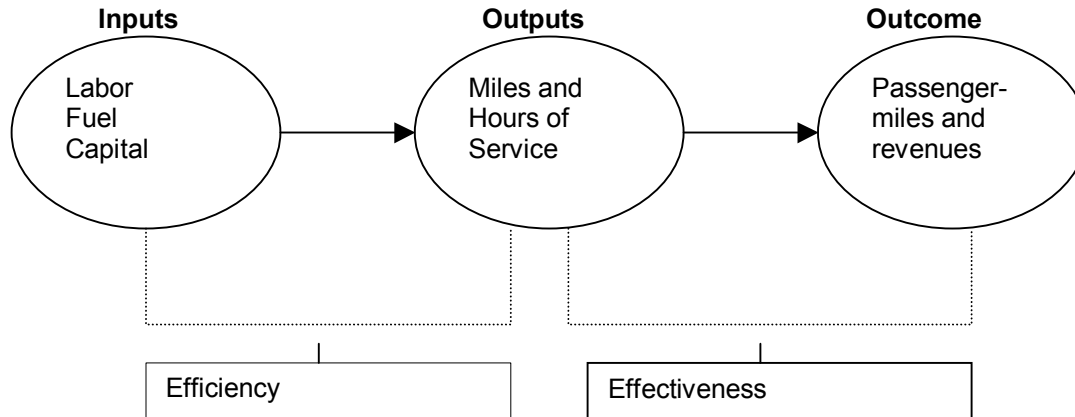
2.2. The Definition of Transit Performance

“The purpose of performance measurement is to compare behavior of organizations over time, across space, or both” (De Borger et al. 2002:3). But besides this benchmarking purpose, other objectives of performance measurement exist as well. The selection of a measure depends upon who will use it, and for what purposes (Behn: 2003:586). There exists a large variety of transit performance measures including passengers per vehicle, passengers per service mile, revenue vehicle hours per operating expense, and vehicle hours by employee.

In my research I will use efficiency and effectiveness measures for two reasons: the public sector has to operate efficiently and effectively (De Borgert et al. 2002: 3), and efficiency and effectiveness data are available and published yearly.

The National Transit Database, published yearly by the FTA, consists of data of over five hundred transit systems that receive federal assistance. Each transit system completes a transit database report for their system, consisting of general, financial, and modal data, as well as performance and trend indicators for that particular year. This database is often used as a research source and, although recognized as the best data source available, it has its shortcoming; it only includes transit systems in urban areas, and it does not include all transit agencies because transit systems that do not receive federal subsidy are not required to report. However, approximately ninety-three percent of all transit ridership is counted in the National Transit Database (Mineta Transportation Institute 2002: 173). The following figure shows how efficiency and effectiveness are defined in this research.

Figure 1: Transit Production Process



Source: Definitions in 2000 National Transit Summaries and Trends

The figure distinguishes three dimensions (1) input: labor, capital and fuel (2) output: miles and hours of service produced and (3) outcome: passenger miles, and revenue. Performance can be defined based on these dimensions. Note that many alternative ways to define performance exist.² The relation between input and output measures efficiency: what are the miles or hours of service in relation to labor, fuel and capital? The relation between output and outcome is defined as effectiveness: what are the passenger miles or revenues in relation to miles and hours of service? For purposes of this study both performance measures are relevant.

2.3. Factors that Could Impact Transit Performance

Besides regional transit reform there are numerous other factors that impact transit performance, either inside the control of transit management (internal factors) or outside the control of transit management (external factors). The following two lists provide internal and

² For example inputs: fuel, labor, capital, throughput: miles and hours of service, output: passenger miles and revenues, outcome: access to mobility, congestion and energy reduction.

external factors that could impact transit performance. In addition, these factors are drafted in an arrow-model to visualize the expected relation.

Internal Factors

- Change in transit service provided; increase of service miles and service hours could impact transit usage (and therefore effectiveness) positively, a decrease in transit service could impact effectiveness negatively.
- Change of transit efficiency; if efficiency is increased, more miles or hours of service will be provided for the same costs, or the same miles or hours of service will be provided for less costs. Both situations, more service (change in transit service provided), or cheaper service will impact transit effectiveness positively.
- Change of transit fares; a change in fare policies will impact both transit revenues and passenger miles. Therefore it is impossible to address the overall impact on transit effectiveness without further analysis. Between 1991 and 1999 changes in transit fares were closely correlated with changes in overall transit patronage (Mineta Transportation Institute, 2002:28)
- Implementation of policies that stimulate transit (push factors).

External Factors

- Demographic factors; change in population size, especially change in size of transportation disadvantaged population. A total population decrease will impact transit effectiveness negatively. A decrease in the transportation disadvantaged population will have a negative impact as well, probably stronger. Population size and size of disadvantaged population are related as well; in general the larger the population size, the larger the transit dependent population.
- Increased spatial distribution of transit users; for example when public housing in New Orleans was selectively demolished, this distributed its transit users all over the region; previously these transit users were concentrated. They are now more difficult to serve because they are located throughout the region, probably, in some cases, not even having access to transit. This will decrease transit usage, and therefore effectiveness. When transit users are geographically more concentrated, transit will be more effective. (Note that in the extreme case of concentration transit is not needed anymore).
- Spatial distribution of jobs; basically the same reasoning as with the spatial distribution of transit users. Implementation of policies that negatively impact car usage (pull factors) i.e. taxation of car ownership, restrictions on car ownership, fuel tax, number of parking spaces, cost of parking, parking enforcements, road pricing, etc. (European Commission, 1996:8).
- Change of economic factors, such as employment levels, gross domestic product and wage levels can impact transit performance. The Mineta Transportation Institute (2002:30-35) found a negative correlation between unemployment rate and overall transit usage during the 1990s, and a positive correlation between GDP and GDP per capita and transit ridership. Transit trips per capita were strongly correlated with changes in average real wages.

Figure 2a: Arrow Model Transit Efficiency

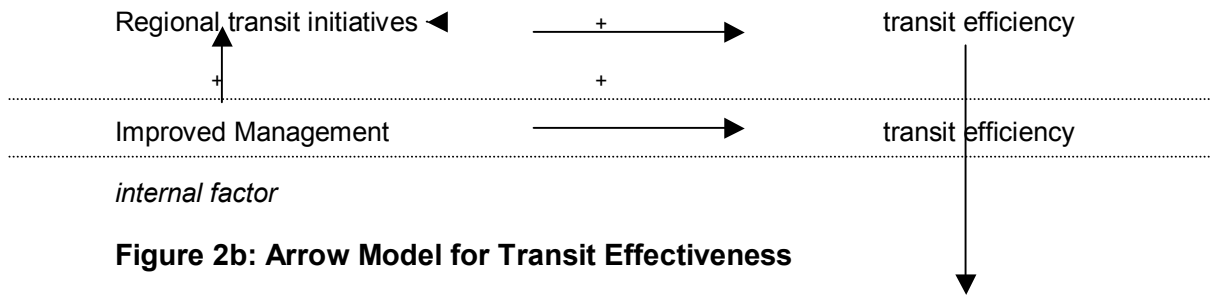
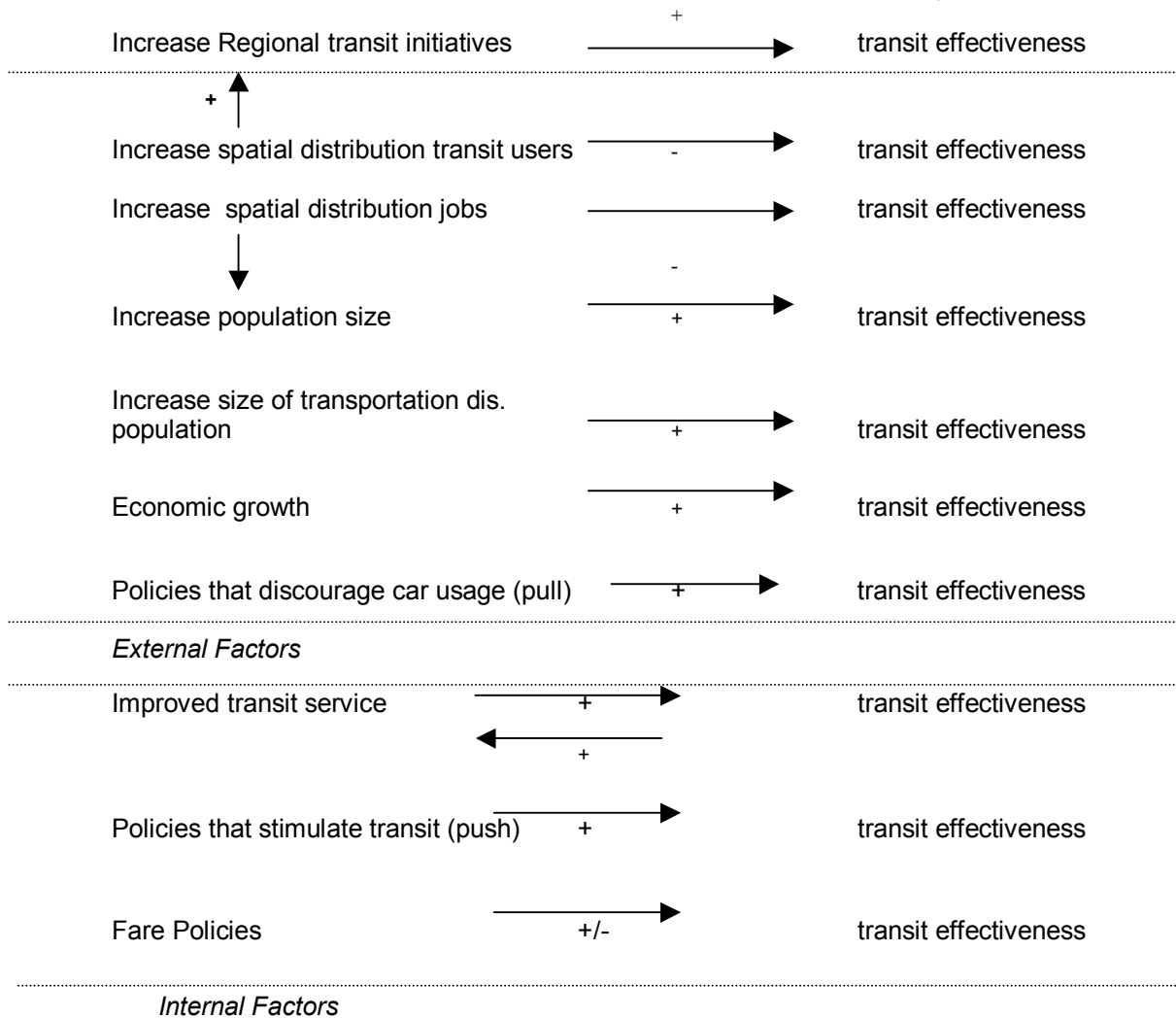


Figure 2b: Arrow Model for Transit Effectiveness



3. Data Collection and Methods

3.1. National Transit Data Base for Performance Data

I collected NTD performance data on transit agencies which had a service population between 200,000 and 1,000,000 between 1996-2000 in the Southern Region (as defined by the Census Bureau) of the USA, including the following states: Oklahoma, Texas, Louisiana, Arkansas, Mississippi, Alabama, Georgia, Florida, South Carolina, North Carolina, Tennessee, Kentucky, West Virginia, Virginia, and Maryland.

The selection criteria, location and service population, were chosen because the New Orleans Regional Transit Authority, and Jefferson Transit both have a service population in that same category, and they, of course, operate in the South.

In total there are 42 transit agencies operating in these states with a service population between 200,000 and 1,000,000. For 7 of the 42 selected transit agencies fixed route bus performance data of the NTD were not available for the entire study period, and these agencies were eliminated from the sample. Therefore the sample size is reduced to 35.

3.2. Questionnaire and Transit Web-site Analysis for Regional Initiatives Data

A survey was used to collect data regarding regional initiatives implemented by transit agencies (see appendix A). The survey was directed at the chairmen of different transit agencies, under the assumption that they best have an overview of what is going on in their agency. The mail survey included questions about the number of regional initiatives that an agency has implemented, and about the existence and character of other factors besides regional initiatives which impact transit performance as well; the internal and external factors as listed earlier. Regional initiatives were explained in the survey as follows: 'an initiative is considered regional when more than one transit agency is involved in the initiative; it is a cooperative effort between different transit agencies to improve overall transit. Examples of

such efforts include: one fare system and one phone number for transit schedule information in the whole region.'

It can be argued that chairmen will have the tendency to show a more positive reality. Therefore, the survey will ask for regional coordination initiatives that can be verified by policy agreements between transit agencies. As pointed out, for the dependent variable the NTD transit performance figures will be used and not the chairmen's survey results.

On February 18, 2003 a questionnaire, including a return envelope was sent out to 35³ transit agencies in the Southern states of the U.S. serving a population between 200,000 and 1,000,000 people. Follow up was done three different times by email, one time by phone and one more time by email. The response rate was low, twelve agencies filled out the survey and returned it, one agency responded that it was not able to fill out the questionnaire because it did not have the data available, and three agencies responded negatively in the sense that they did not want to fill out the survey.

Overall, this means a response rate of approximately 34 percent ((12/35). This rather low response rate will negatively impact both the external validity (establishing the domain to which a study's findings can be generalized) and the reliability (demonstrating that the operations of a study can be repeated with the same results).

To compensate for the low response data the different web-sites of the transit agencies have been analyzed. All web-sites of the 35 transit agencies were checked in April 2003 to find if these transit agencies point out any cooperative initiatives with other public transit agencies. Through this analysis, additional regional initiatives information was collected.

³ The questionnaire was originally sent to 42 agencies, however when during data collection it became clear that performance data over 1996-2000 of seven agencies were missing, these agencies were eliminated from the sample.

4. Analysis: Performance and Regional Initiatives

It can be concluded, both from the survey as well as from the web analysis, that not many transit agencies implemented cooperative initiatives. From the 35 transit agencies only twelve did. If transit agencies implemented initiatives, the number of initiatives in all twelve cases was less than five. (The questionnaire included the following categories of number of regional initiatives 0, 0-5, 6-10, 11-15, 15 and more). This result impacts the original ideas regarding data analysis; finding a relation between the number of regional initiatives and transit performance, because all the transit agencies that did implement initiatives fall in the first category. Therefore, the analysis focuses on the comparison between agencies that implemented regional initiatives versus agencies which did not implement any regional initiative.

Cooperative initiatives listed by the agencies include shared transfer points, fare system, express busses from suburban area to central city, regional trip planner, regional information phone number, and regional advertising.

The assumption, based on the experience in New Orleans was that, agencies do not cooperate for political reasons. The survey provides an additional insight; many agencies are the only transit agency which provides service in a particular area, and therefore cooperation is no option. However, it appeared that agencies thought of urban systems in their region, when answering this specific question, but rural systems with fixed route service need to be considered as well (Only one agency refers to their cooperation with rural systems).

The following table categorizes the transit agencies in two groups: agencies with (12) and agencies without cooperative initiatives (21).⁴ This categorization is based on the survey results and analysis of the web-sites.

⁴ Two agencies did not have a website.

Table 3: Transit Agencies with and without Cooperative Initiatives

Transit Agencies with Cooperative Initiatives	Transit Agencies without Cooperative Initiatives
Alabama	Alabama
	Metro Transit, Mobile
Georgia	Georgia
Cobb Community Transit, Marietta Department of Transportation, Columbus	
Kentucky	Kentucky
Transit Authority of Northern Kentucky, Fort Wright	Transit Authority Lexington Fayette, Lexington Transit Authority of River City, Louisville
Louisiana	Louisiana
Jefferson Department of Transit Administration, Gretna* Regional Transit Authority, New Orleans*	Shreveport Area Transit System, Shreveport Capital Transportation Corporation (CTC), Baton Rouge
Florida	Florida
Manatee County Area Transit, Bradenton Sarasota County Transportation Authority, Sarasota County of Volusia, dba: VOTRAN, South Daytona	Escambia County Area Transit Pensacola Lee County Transit, Ft. Meyers Space Coast Transit, Cocoa Palm Tran Inc. West Palm Beach Pinellas Suncoast Transit Authority, Clearwater Jacksonville Transportation Authority
North Carolina	North Carolina
Research Triangle Regional Public Transit Authority	Capital Area Transit, Raleigh Charlotte Area Transit System, Charlotte
South Carolina	South Carolina
Charleston Area Regional Transportation, Charleston	
Virginia	Virginia
Potomac and Rappahannock Transportation Commission, Woodbridge	Greater Richmond Transit Company
Texas	Texas
Corpus Christi Regional Transportation Authority, Corpus Christi	Sun Metro, El Paso Forth Worth Transportation Authority, Forth Worth
Oklahoma	Oklahoma
	Metropolitan Tulsa Transit, Tulsa Central Oklahoma Transit & Parking Authority, Oklahoma City
Maryland	Maryland
Ride-on Montgomery County Government Rockville	
Tennessee	Tennessee
	Memphis Area Transit Authority, Memphis Metropolitan Transit Authority, Nashville

* Note that although they could cooperate much more, RTA and Jet implemented already a few regional initiatives.

Based on the implementation of regional initiatives, these 33 transit agencies are split in two groups. For both groups representative values for the center of the data set are calculated (trimmed average).⁵ The data are summarized in the following table.

Table 4: Performance data of transit agencies with and without cooperative initiatives

Data service efficiency: operating expense per vehicle revenue mile						
	1996	1997	1998	1999	2000	Average
Average of transit systems with cooperative initiatives	3.26	3.37	3.70	3.67	3.50	3.500
Average of transit systems without cooperative initiatives	3.48	3.47	3.57	3.72	3.87	3.622
Data service efficiency: operating expense per vehicle revenue hour						
	1996	1997	1998	1999	2000	Average
Average of transit systems with cooperative initiatives	49.99	56.90	57.81	59.53	56.14	56.074
Average of transit systems without cooperative initiatives	49.62	49.49	49.04	54.17	55.22	51.508
Data service effectiveness: unlinked passenger trips per vehicle revenue mile						
	1996	1997	1998	1999	2000	Average
Average of transit systems with cooperative initiatives	1.56	1.43	1.63	1.57	1.39	1.516
Average of transit systems without cooperative initiatives	1.67	1.67	1.50	1.63	1.61	1.616
Data service effectiveness: unlinked passenger trips per vehicle revenue hour						
	1996	1997	1998	1999	2000	Average
Average of transit systems with cooperative initiatives	24.11	25.07	26.69	24.16	20.95	24.196
Average of transit systems without cooperative initiatives	23.09	22.95	20.55	21.99	22.55	22.226

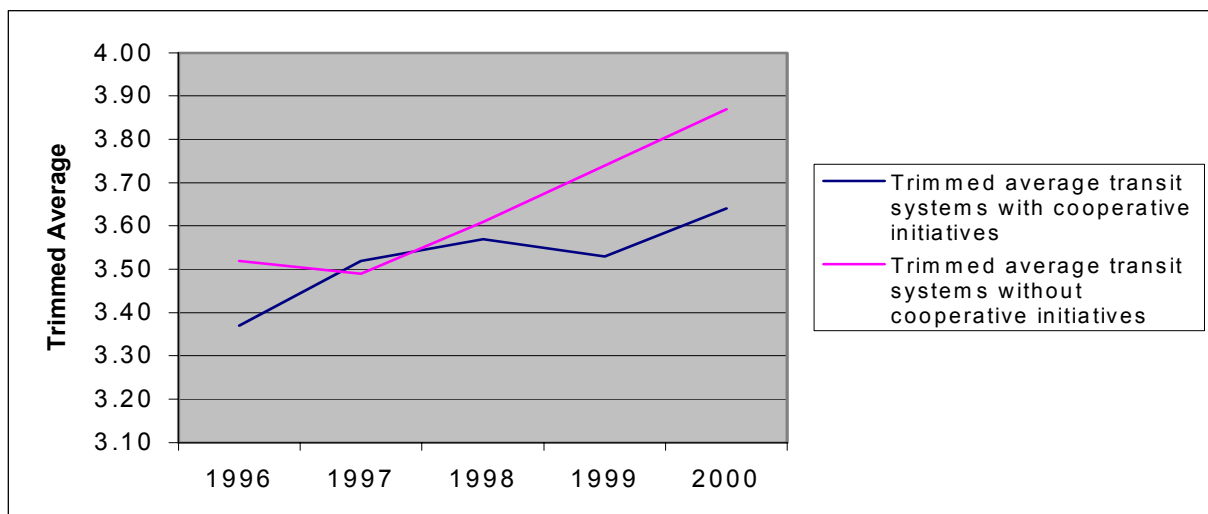
The research hypothesis is that transit agencies that implemented regional initiatives perform better than transit agencies that did not implement any regional initiatives. The following

⁵ All the observations below the first and above the third quartile were removed (per indicator per year),

figures show the performance trends for transit agencies which did implement, and for transit agencies that did not implement regional initiatives related to: (1) operating expense per vehicle revenue mile, (2) operating expense per vehicle revenue hour, (3) unlinked passenger trips per vehicle revenue mile, and (4) unlinked passenger trips per vehicle revenue hour. Note that with regard to the first two performance indicators, a better performance is demonstrated by lower performance indicators, whereas with regard to the last two performance indicators a better performance is demonstrated by higher performance indicators.

In addition to a short analysis of these figures, the research hypothesis is statistically tested for all four performance indicators.⁶

Figure 3: Service Efficiency: operating expense per vehicle revenue mile



and the average of the remaining observations was calculated to exclude “wild” observations.

⁶ These averages give an indication of the averages between 1996-2000.

Figure 3 shows the average of the operating expense per vehicle revenue mile. Transit systems without cooperative initiatives have an upward curve that increases faster than the curve of the trimmed average of the transit systems with cooperative initiatives. Therefore, it appears that the average service efficiency of transit systems that implemented cooperative initiatives is higher than the average of transit agencies that didn't.

To see if the original hypothesis 'performance increases when cooperative initiatives are implemented' has any statistical validity, hypothesis 0 versus hypothesis 1 is tested. H0: 'trimmed averages of both groups are equal', versus H 1: 'trimmed average of the operating expense per vehicle revenue mile is lower for transit agencies that implemented cooperative initiatives than it is for transit agencies that did not' is tested. Thus, H0: $\text{avg } 1 = \text{avg } 2$, versus $\text{avg } 1 < \text{avg } 2$. The following table includes the used test assumption and statistics.

Table 5: Test Assumptions and Statistics

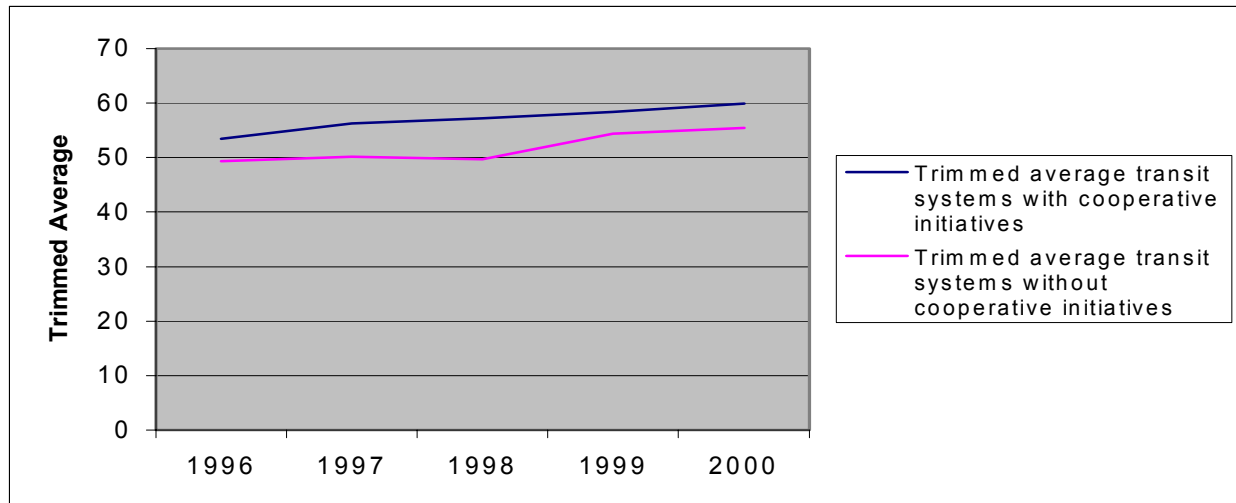
Assumptions
Transit systems with cooperative initiatives and transit systems without cooperative initiatives are both random samples from normal populations with means μ_1 and μ_2 and with a common variance.
Test Statistics
$T = (\text{avg } 1 - \text{avg } 2) / \sqrt{\text{pooled sample variance} (1/n_1 + 1/n_2)}$ d.f. = $n_1 + n_2 - 2$ $n_1 = 12, n_2 = 21$ Alternative hypothesis: Level α rejection region: H1 : $\text{avg } 1 - \text{avg } 2 > 0$ $t > t_\alpha (\alpha = 0.05)$ H1: $\text{avg } 1 - \text{avg } 2 < 0$ $t < -t_\alpha$ (avg = average)

Source: Bhattacharyya & Johnson 1997: 293.

When the test statistics are applied, $T = -2.96$ is found, and the rejection region is $R < -1.696$. From this it can be concluded that the null hypothesis is rejected, the evidence is strong

enough to conclude that transit agencies that implemented cooperative initiatives operate more service efficient.

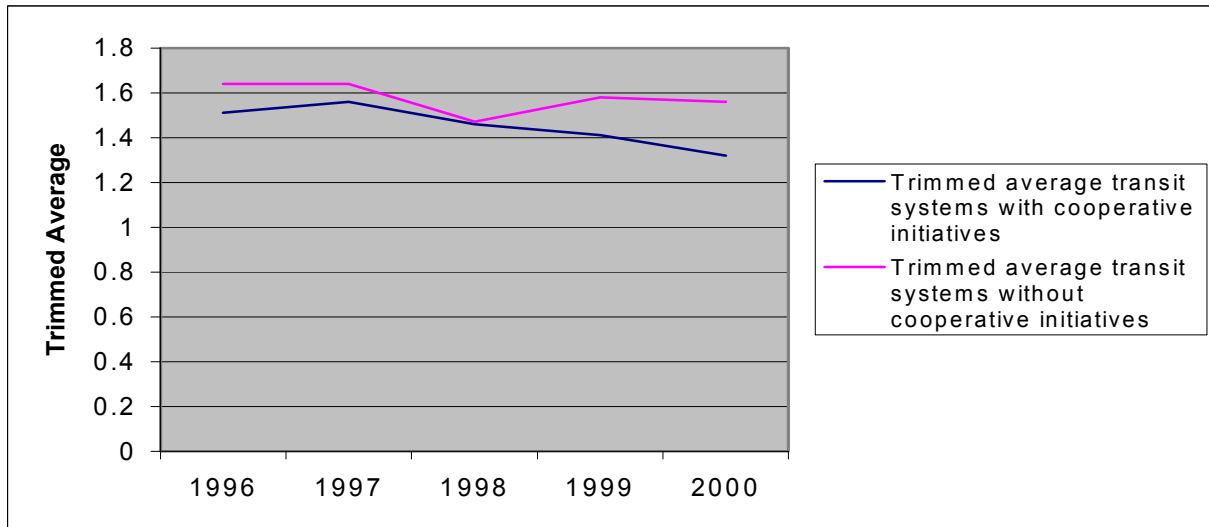
Figure 4: Service Efficiency: operating expense per vehicle revenue hour



From the above figure it appears that transit agencies that implemented cooperative initiatives operate less efficiently, the trimmed average of the operating expense per vehicle revenue hour remains higher during the entire sample period.

However when the test statistics are applied, $T = 7.56$ is found, and the rejection region is $R < -1.696$. From this it can be concluded that the null hypothesis, is not rejected.

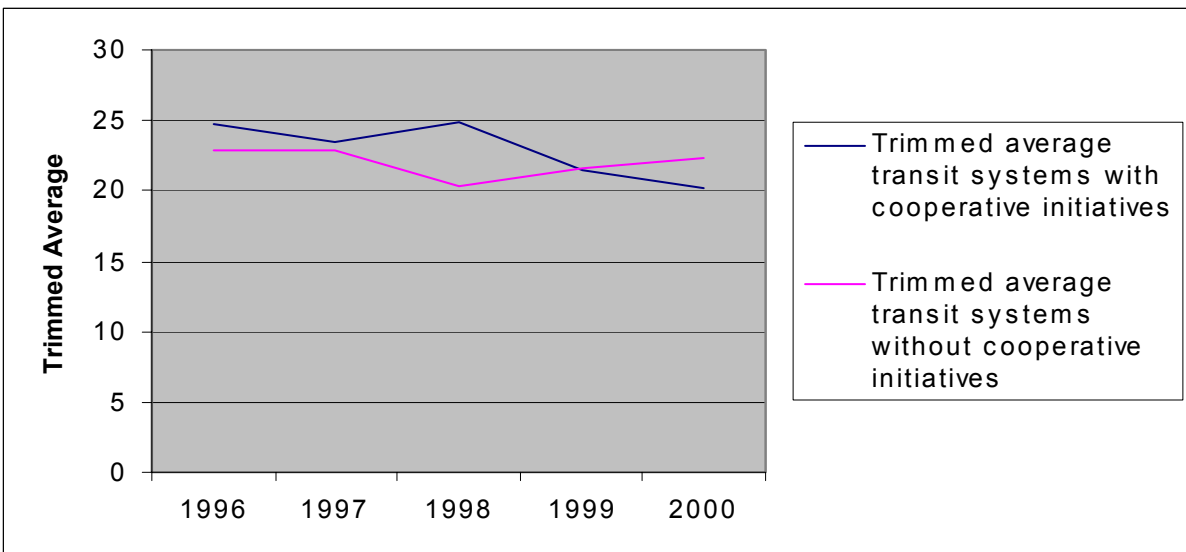
Figure 5: Service Effectiveness: unlinked passenger trips per vehicle revenue mile



From figure 5 it can be concluded that unlinked passenger miles per vehicle revenue mile remain higher (except for 1998) for transit agencies that did not implement cooperative initiatives. Note that the alternative hypothesis has changed: $H_1: \text{avg } 1 > \text{avg } 2$, as the assumption is that regional initiatives improve the number of passenger trips.

When the test statistics are applied, $T = -6.25$ is found, and the rejection region is $R > 1.696$. Therefore the null hypothesis is not rejected.

Figure 6:Service Effectiveness: unlinked passenger trips per vehicle revenue hour



The second service effectiveness indicator shows that approximately until 1999 the transit agencies that implemented cooperative initiatives scored higher than those without cooperative initiatives. However, transit systems without cooperative initiatives show an increasing trend since 1998, whereas transit systems with cooperative initiatives show a downward trend, since 1998.

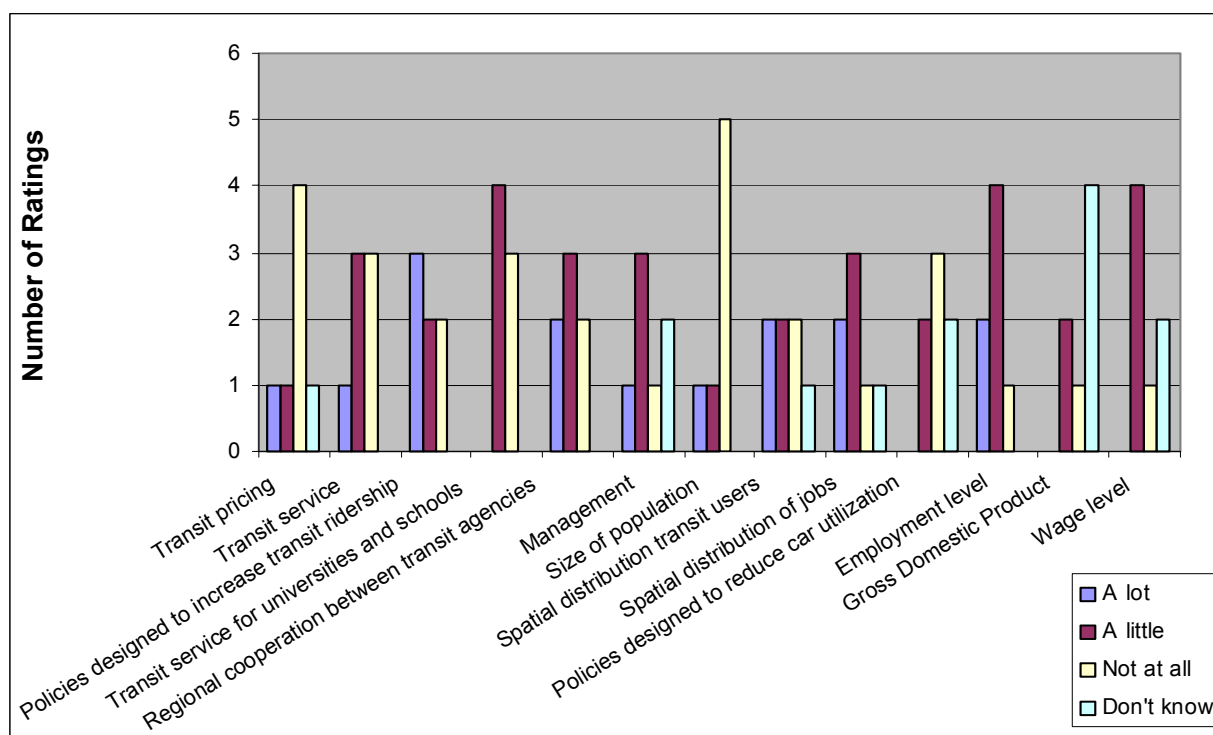
When the test statistics are applied, $T = 6.5$ is found, and the rejection region is $R > 1.696$. The conclusion is that the null hypothesis is rejected, which means that the transit systems with cooperative initiatives performed better during the 1996–2000 period.

An additional way to better understand the relationship between transit performance and regional initiatives is a further analysis of the survey question that dealt with how change in transit performance between 1996 and 2000 could be attributed to the impact of different factors. The respondents received a list of internal and external factors, referring to within the control of transit management and outside the control of transit management. Internal factors included: transit pricing, transit service (quality), policies designed to increase transit ridership, transit service for universities and schools, regional cooperation between transit agencies, and

management. External factors included size of population, spatial distribution transit users, spatial distribution of jobs, policies designed to reduce car utilization, employment level, gross domestic product, wage level.

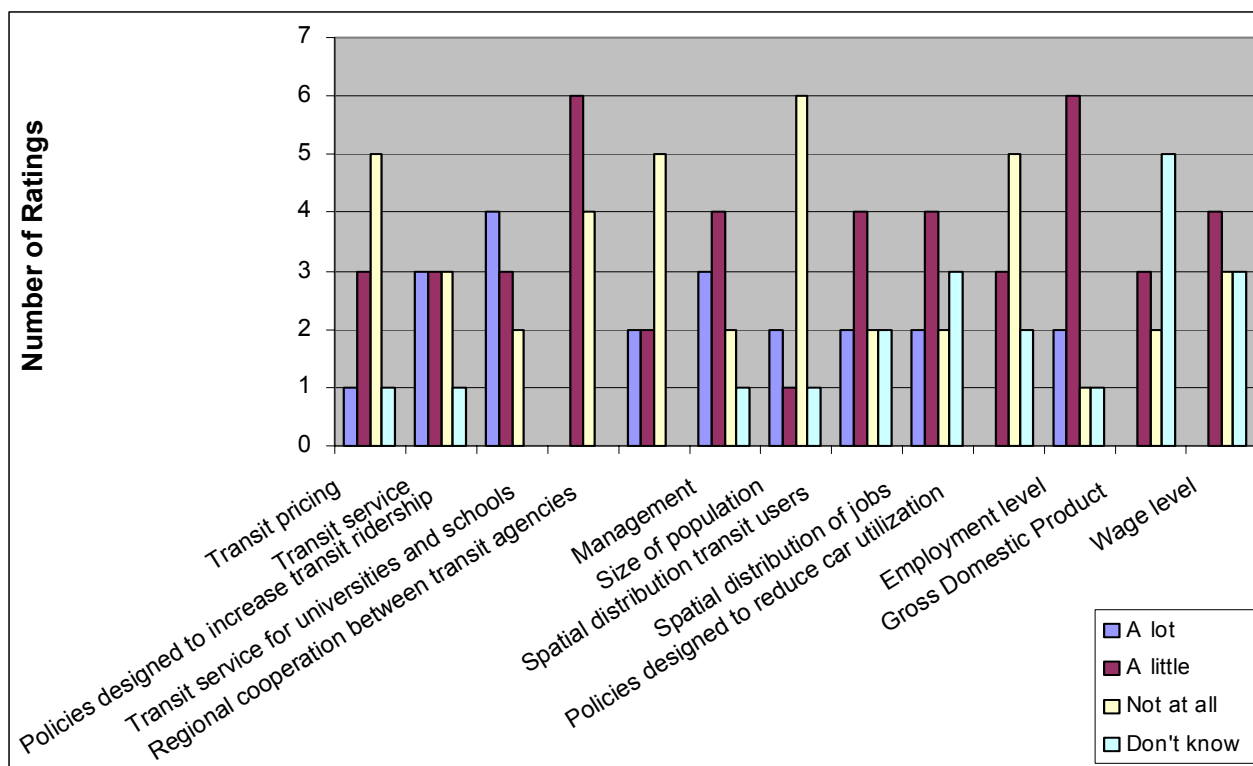
The following figures show how the different agencies attributed these factors to the change (negative and positive) of transit performance within their agency. The first figure includes only agencies that did implement cooperative initiatives whereas the second figure includes both agencies that implemented cooperative initiatives and agencies that did not.

Figure 7: Factors Attributing to Performance Change: Agencies with Cooperative Initiatives



From figure 7 it appears that although agencies have implemented cooperative initiatives they are not very convinced that it had an significant impact on transit performance. Two agencies attributed a lot of impact of regional initiatives to performance change, three agencies attributed a little impact, and two agencies attributed no impact at all. Figure 8 points that out even more strongly, which is according the expectation: transit agencies that did not implement any regional initiatives, do in general not attribute performance change to regional cooperation. However, the survey response is more positive about the impact then the analysis.

**Figure 8: Factors Attributing to Performance Change:
Agencies with and without Cooperative Initiatives**



5. Findings & Implications

Do regional transit initiatives improve transit performance? This paper addresses this question. Based on literature and opinions of transit experts the hypothesis was that, yes, regional transit initiatives do improve transit performance. However, this analysis of the data is only partly supportive of this hypothesis. The service efficiency defined as operating expense per vehicle revenue mile, is higher for agencies that do cooperate, as is the service effectiveness defined as unlinked passenger trips per vehicle revenue hour. The other two performance indicators, operating expense per vehicle revenue hour and unlinked passenger trips per vehicle revenue mile do not show any significant difference between the agencies that have and have not implemented cooperative initiatives.

From the questionnaire results it appears that although agencies have implemented cooperative initiatives they are not very convinced that it had an significant impact on transit performance.

Thus although results show that cooperation might have some positive impact on transit performance, the results are not as convincing as literature and transit professionals point out. I will address a few factors which might have impacted the results of the research analysis. First, it might be that the research data are not valid, especially the categorization of agencies based on the Internet analysis. It could be that agencies that implemented regional initiatives do not point these initiatives out on their web sites. Secondly, the assumption was that categorization of agencies in two groups, would increase the internal validity as both groups are impacted by the same internal and external factors. Maybe this assumption does not hold. Third, it could be that agencies only then implement regional initiatives when their performance is low, whereas agencies that score already high do not feel the need to implement regional initiatives. Fourth, it might be that performance does improve because of regional initiatives, but that the impact is

too small to really show in the performance data of the NTD, especially as most agencies who did implement regional initiatives only implemented less than five. Fifth, it might be that performance does improve but is not measured by the NTD performance indicators. Sixth, a negative impact of regional cooperation on transit performance could also be an explanation of the findings, and should not be omitted.

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Appendix A

Transit Performance Survey

Thank you for filling out this questionnaire. The instructions for answering each question should be self explanatory. Please feel free to add comments in the margins or to use the back of any sheet to provide additional information or insights.

1. Agency information

The first series of questions asks for facts about you, and your agency.

Name:

Position:

Agency:

Address:

City:

Telephone:

E-mail:

In which counties (parishes) does your agency operate? Please list.

Do you want to be provided with the results of this survey? Yes / No

2. Transit Performance

Transit performance is defined in terms of service efficiency and effectiveness (operating expense per vehicle revenue mile, operating expense per vehicle revenue hour, unlinked passenger trips per vehicle revenue mile, unlinked passenger trips per vehicle revenue hour). The following questions focus on the performance of your fixed route bus service.

- a. How did your transit agency perform in the period of FY 1996-2000?
- b. Is the performance of your transit agency correctly reflected in the National Transit Database? Please explain.

- c. To which of the factors listed below do you attribute the change in transit performance (efficiency and effectiveness) between 1996 and 2000? The list distinguishes between factors inside the control of transit management (internal factors) and outside the control of transit management (external factors).

	A lot	A Little	Not at all	Don't know	Briefly explain
<i>Internal Factors</i>					
Transit pricing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Transit service (quality)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Policies designed to increase transit ridership	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Transit service for universities and schools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Regional cooperation between transit agencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<i>External Factors</i>					
Size of population	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spatial distribution transit users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Spatial distribution of jobs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Policies designed to reduce car utilization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Employment level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Gross Domestic Product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Wage level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

- d. Are there other factors to which you attribute change in transit performance between 1996 and 2001? Please explain.

3. Other Factors that Impact Transit Performance

This section addresses different factors that can impact transit efficiency and effectiveness in more detail.

a. Policies designed to increase transit ridership

Are there policies in place that stimulate transit in your region, such as tax incentives for businesses that stimulate transit usage by their employees? If yes, please explain these policies briefly.

Policy Type	Brief Description	Implementation Date	Effectiveness
			<input type="checkbox"/> Ineffective <input type="checkbox"/> Moderate effective <input type="checkbox"/> Effective
			<input type="checkbox"/> Ineffective <input type="checkbox"/> Moderate effective <input type="checkbox"/> Effective
			<input type="checkbox"/> Ineffective <input type="checkbox"/> Moderate effective <input type="checkbox"/> Effective
			<input type="checkbox"/> Ineffective <input type="checkbox"/> Moderate effective <input type="checkbox"/> Effective

b. Policies designed to reduce car utilization

Are there policies in place that reduce car usage in your region such as taxation of car ownership, number of parking spaces, costs of parking, road pricing etc.

If yes, please briefly explain these policies and include when they were implemented and their effectiveness.

Policy Type	Brief Description	Implementation Date	Effectiveness
			<input type="checkbox"/> Ineffective <input type="checkbox"/> Moderate effective <input type="checkbox"/> Effective
			<input type="checkbox"/> Ineffective <input type="checkbox"/> Moderate effective <input type="checkbox"/> Effective
			<input type="checkbox"/> Ineffective <input type="checkbox"/> Moderate effective <input type="checkbox"/> Effective
			<input type="checkbox"/> Ineffective <input type="checkbox"/> Moderate effective <input type="checkbox"/> Effective

c. Transit Service for Schools and Universities

Does your transit agency provide services for schools and/or universities in the region?
Please explain and indicate when these services were put in place.

4. Regional Transit Initiatives

An initiative is considered regional when more than one transit agency is involved in the initiative; it is a cooperative effort between different transit agencies to improve overall transit. Examples of such efforts include: one fare system and one phone number for transit schedule information in the whole region.

a. How many regional initiatives were implemented by your transit agency between 1996 and 2000?

- ☐ 0
- ☐ 0 - 5
- ☐ 5 - 10
- ☐ 10-15
- ☐ 15 and more

If your agency implemented no regional initiatives, please explain why not. You can omit the following question.

b. Please fill out the following table: when initiatives were implemented, the type and content of initiatives, other transit agencies involved, the impact on transit performance, and where possible refer to and include policy documents.

Type of Initiatives	Content of Initiatives	Other Transit Agencies Involved	Impact on Transit Performance	Policy Documents
FY 2000			<input type="checkbox"/> No impact <input type="checkbox"/> Moderate impact <input type="checkbox"/> Impact	
FY 1999			<input type="checkbox"/> No impact <input type="checkbox"/> Moderate impact <input type="checkbox"/> Impact	
FY 1998			<input type="checkbox"/> No impact <input type="checkbox"/> Moderate impact <input type="checkbox"/> Impact	
FY 1997			<input type="checkbox"/> No impact <input type="checkbox"/> Moderate impact <input type="checkbox"/> Impact	
FY 1996			<input type="checkbox"/> No impact <input type="checkbox"/> Moderate impact <input type="checkbox"/> Impact	

Thanks for your participation!

Vita

Anne-Marie Rooskens received her Master of Public Administration from the University of Twente, The Netherlands, in 1995. During her study she worked a year for the Ministry of Transport and she did her thesis at the Province of South-Holland where she worked during a nine month period. After her study she started as a policy advisor at the Port of Rotterdam. In 1999 she moved to New Orleans, where she started working at the Intermodal Transportation Policy and Implementation Center at the College of Urban and Public Affairs of the University of New Orleans. There she got interested in the study programs of CUPA.